IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Original): An image-processing device comprising:

a quantization threshold produce unit producing a plurality of quantization threshold values corresponding to each of pixels of multivalued image data according to a dither threshold matrix;

a random dither quantize unit quantizing said multivalued image data in multivalues by a random dither process using said quantization threshold values so as to output quantized data; and

a resolution convert binarize unit converting said quantized data into binary image data having a resolution higher than a resolution of said multivalued image data,

wherein said resolution convert binarize unit determines the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed, and controls the order of arranging said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 2 (Original): The image-processing device as claimed in claim 1, wherein said order of arranging said dot-on pixels is controlled so as to form dots of a dot-concentrated type.

Claim 3 (Original): The image-processing device as claimed in claim 2, wherein said dither threshold matrix contains threshold values so arranged as to form the dots of the dot-concentrated type.

Claim 4 (Original): The image-processing device as claimed in claim 3, wherein smallest four threshold values among said threshold values in said dither threshold matrix are arranged at different pixel positions.

Claim 5 (Original): The image-processing device as claimed in claim 4, wherein the difference between a fourth smallest threshold value and a fifth smallest threshold value in said dither threshold matrix is larger than a step width of said dither threshold matrix.

Claim 6 (Original): The image-processing device as claimed in claim 3, wherein said dither threshold matrix comprises at least two basic dither threshold matrixes containing the threshold values so arranged as to form the dots of the dot-concentrated type, the two basic dither threshold matrixes being joined in a main scanning direction at a position shifted in a sub-scanning direction.

Claim 7 (Original): The image-processing device as claimed in claim 1, further comprising an image characteristic extract unit extracting an image characteristic of said multivalued image data, wherein said quantization threshold produce unit controls amplitude of said quantization threshold values according to a characteristic amount output by said image characteristic extract unit.

Claim 8 (Original): The image-processing device as claimed in claim 7, wherein said quantization threshold produce unit controls the amplitude of said quantization threshold values by switching said dither threshold matrix used for producing said quantization threshold values.

Claim 9 (Original): The image-processing device as claimed in claim 7, wherein said image characteristic extract unit outputs an edge amount of said multivalued image data as said characteristic amount, and said quantization threshold produce unit makes the amplitude of said quantization threshold values smaller as said edge amount becomes larger.

Claim 10 (Original): The image-processing device as claimed in claim 9, wherein said image characteristic extract unit outputs the edge amount of said multivalued image data after subjecting the edge amount to an expanding process for expanding an edge field of said multivalued image data.

Claim 11 (Original): The image-processing device as claimed in claim 9, wherein said image characteristic extract unit outputs the edge amount of said multivalued image data after equalizing the edge amount.

Claim 12 (Original): The image-processing device as claimed in claim 9, wherein said quantization threshold produce unit produces a constant value as the quantization threshold values when said edge amount output by said image characteristic extract unit is maximum.

Claim 13 (Original): The image-processing device as claimed in claim 9, wherein said quantization threshold produce unit produces values varying according to a value of said multivalued image data as the quantization threshold values when said edge amount output by said image characteristic extract unit is maximum.

Claim 14 (Original): The image-processing device as claimed in claim 13, wherein said value of said multivalued image data is an average value in the pixel being processed and adjacent pixels thereof.

Claim 15 (Original): The image-processing device as claimed in claim 13, wherein said quantization threshold produce unit varies said values varying according to the value of said multivalued image data such that said random dither quantize unit quantizes said multivalued image data in a smaller number of multivalues as the value of said multivalued image data becomes larger.

Claim 16 (Original): The image-processing device as claimed in claim 15, wherein said resolution convert binarize unit arranges said dot-on pixels in said plural-pixel field according to a predetermined arranging order when said edge amount output by said image characteristic extract unit is maximum.

Claim 17 (Original): An image-processing device for converting quantized data of multivalued image data into binary image data having a resolution higher than a resolution of said multivalued image data, the quantized data being obtained by quantizing said multivalued image data in multivalues by a random dither process using a plurality of quantization threshold values produced according to a dither threshold matrix, the image-processing device comprising:

a dot number determine unit determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed; and

a dot output position determine unit controlling the order of arranging said number of said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 18 (Original): The image-processing device as claimed in claim 17, wherein said order of arranging said number of said dot-on pixels in said plural-pixel field is controlled so as to form dots of a dot-concentrated type.

Claim 19 (Original): The image-processing device as claimed in claim 17, wherein said dot output position determine unit is supplied with information indicating an edge field so that said dot output position determine unit arranges said dot-on pixels in a plural-pixel field of said binary image data according to a predetermined arranging order, the plural-pixel field corresponding to a pixel in the edge field of said multivalued image data.

Claim 20 (Original): The image-processing device as claimed in claim 1, further comprising an image-forming unit forming an image according to said binary image data.

Claim 21 (Original): The image-processing device as claimed in claim 17, further comprising an image-forming unit forming an image according to said binary image data.

Claim 22 (Original): The image-processing device as claimed in claim 1, further comprising an image-reading unit reading said multivalued image data by optically scanning a subject copy, and an image-forming unit forming an image according to said binary image data.

Claim 23 (Original): A computer readable recording medium storing program code for causing a computer to process an image, the recording medium comprising:

quantization-threshold-produce program code means for producing a plurality of quantization threshold values corresponding to each of pixels of multivalued image data according to a dither threshold matrix;

random-dither-quantize program code means for quantizing said multivalued image data in multivalues by a random dither process using said quantization threshold values so as to output quantized data; and

resolution-convert-binarize program code means for converting said quantized data into binary image data having a resolution higher than a resolution of said multivalued image data,

wherein said resolution-convert-binarize program code means determines the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed, and controls the order of arranging said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 24 (Original): A computer readable recording medium storing program code for causing a computer to convert quantized data of multivalued image data into binary image data having a resolution higher than a resolution of said multivalued image data, the quantized data being obtained by quantizing said multivalued image data in multivalues by a random dither process using a plurality of quantization threshold values produced according to a dither threshold matrix, the recording medium comprising:
dot-number-determine program code means for determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the

quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed; and

dot-output-position-determine program code means for controlling the order of arranging said number of said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 25 (Original): An image-processing method comprising:

a quantization-threshold-producing step of producing a plurality of quantization threshold values corresponding to each of pixels of multivalued image data according to a dither threshold matrix;

a quantizing step of quantizing said multivalued image data in multivalues by a random dither process using said quantization threshold values so as to generate quantized data; and

a converting step of converting said quantized data into binary image data having a resolution higher than a resolution of said multivalued image data,

wherein said converting step includes determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed, and includes controlling the order of arranging said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 26 (Original): The image-processing method as claimed in claim 25, wherein said order of arranging said dot-on pixels is controlled so as to form dots of a dot-concentrated type.

Claim 27 (Original): The image-processing method as claimed in claim 25, further comprising an image-characteristic-extracting step of extracting an image characteristic of said multivalued image data, wherein said quantization-threshold-producing step controls amplitude of said quantization threshold values according to a characteristic amount extracted by said image-characteristic-extracting step.

Claim 28 (Original): The image-processing method as claimed in claim 27, wherein said image-characteristic-extracting step extracts an edge amount of said multivalued image data as said characteristic amount, and said quantization-threshold-producing step makes the amplitude of said quantization threshold values smaller as said edge amount becomes larger.

Claim 29 (Original): The image-processing method as claimed in claim 28, wherein said image-characteristic-extracting step extracts, as said characteristic amount, the edge amount subjected to an expanding process for expanding an edge field of said multivalued image data.

Claim 30 (Original): The image-processing method as claimed in claim 28, wherein said image-characteristic-extracting step extracts, as said characteristic amount, the edge amount being equalized.

Claim 31 (Original): The image-processing method as claimed in claim 28, wherein said quantization-threshold-producing step produces a constant value as the quantization threshold values when said edge amount extracted by said image-characteristic-extracting step is maximum.

Claim 32 (Original): The image-processing method as claimed in claim 28, wherein said quantization-threshold-producing step produces values varying according to a value of said multivalued image data as the quantization threshold values when said edge amount extracted by said image-characteristic-extracting step is maximum.

Claim 33 (Original): The image-processing method as claimed in claim 32, wherein said value of said multivalued image data is an average value in the pixel being processed and adjacent pixels thereof.

Claim 34 (Original): The image-processing method as claimed in claim 32, wherein said quantization-threshold-producing step varies said values varying according to the value of said multivalued image data such that said quantizing step quantizes said multivalued image data in a smaller number of multivalues as the value of said multivalued image data becomes larger.

Claim 35 (Original): The image-processing method as claimed in claim 34, wherein said converting step includes arranging said dot-on pixels in said plural-pixel field according to a predetermined arranging order when said edge amount extracted by said image-characteristic-extracting step is maximum.

Claim 36 (Original): An image-processing method for converting quantized data of multivalued image data into binary image data having a resolution higher than a resolution of said multivalued image data, the quantized data being obtained by quantizing said multivalued image data in multivalues by a random dither process using a plurality of quantization threshold values produced according to a dither threshold matrix, the image-processing method comprising:

a dot-number-determining step of determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed; and

a dot-output-position-determining step of controlling the order of arranging said number of said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed.

Claim 37 (Original): The image-processing method as claimed in claim 36, wherein said order of arranging said number of said dot-on pixels in said plural-pixel field is controlled so as to form dots of a dot-concentrated type.

Claim 38 (Original): The image-processing method as claimed in claim 36, wherein said dot-output-position-determining step arranges said dot-on pixels in a plural-pixel field of said binary image data according to a predetermined arranging order, the plural-pixel field corresponding to a pixel in an edge field of said multivalued image data.

Claim 39 (Withdrawn): An image-forming device for converting input multivalued image data of a low resolution into output binary image data of a high resolution, the device comprising:

an edge-level calculating unit calculating an edge level from the input multivalued image data just before undergoing a γ correction;

a γ-correction unit performing a gradation correction by using a printer γ selected according to said edge level;

a quantizing unit quantizing said input multivalued image data into quantized data by a multivalued random dither using a first dither threshold matrix selected according to said edge level; and

a dot position control unit converting said quantized data into the number of dot-on pixels in unit pixels of said high resolution, and controlling the positions of said dot-on pixels in said unit pixels according to a second dither threshold matrix.

Claim 40 (Withdrawn): The image-forming device as claimed in claim 39, wherein said second dither threshold matrix contains threshold values so arranged as to form dots of a dot-concentrated type, and said dot position control unit outputs the dots to pixels in said unit pixels corresponding to positions in an ascending order of said threshold values.

Claim 41 (Withdrawn): An image-forming device for converting input multivalued image data of a low resolution into output binary image data of a high resolution, the device comprising:

an edge-level calculating unit calculating an edge level from the input multivalued image data just before undergoing a γ correction;

a γ-correction unit performing a gradation correction by using a printer γ selected according to said edge level;

a quantizing unit quantizing said input multivalued image data into quantized data by a multivalued random dither using a first dither threshold matrix selected according to said edge level and an output mode; and

a dot position control unit converting said quantized data into the number of dot-on pixels in unit pixels of said high resolution, and controlling the positions of said dot-on pixels in said unit pixels according to a second dither threshold matrix.

Claim 42 (Withdrawn): The image-forming device as claimed in claim 41, wherein said first dither threshold matrix is switched to a dither threshold matrix having different threshold values according to said output mode.

Claim 43 (Withdrawn): The image-forming device as claimed in claim 41, wherein said first dither threshold matrix is switched to a dither threshold matrix having a different arrangement of threshold values according to said output mode.

Claim 44 (Withdrawn): The image-forming device as claimed in claim 41, wherein the dither threshold matrixes are switched to dither threshold matrixes having different sizes according to said output mode.

Claim 45 (Withdrawn): The image-forming device as claimed in claim 39, wherein said first dither threshold matrix has larger amplitude as said edge level becomes smaller.

Claim 46 (Withdrawn): The image-forming device as claimed in claim 41, wherein said first dither threshold matrix has larger amplitude as said edge level becomes smaller.

Claim 47 (Withdrawn): The image-forming device as claimed in claim 39, wherein said edge level is obtained by quantizing an edge amount in a plurality of levels, the edge amount being calculated from said input multivalued image data just before undergoing said γ correction.

Claim 48 (Withdrawn): The image-forming device as claimed in claim 41, wherein said edge level is obtained by quantizing an edge amount in a plurality of levels, the edge amount being calculated from said input multivalued image data just before undergoing said γ correction.

Claim 49 (Withdrawn): The image-forming device as claimed in claim 47, wherein threshold values used in quantizing said edge amount are changed according to a result of a white-background judgment judging whether or not a pixel being processed is a white-background field.

Claim 50 (Withdrawn): The image-forming device as claimed in claim 48, wherein threshold values used in quantizing said edge amount are changed according to a result of a white-background judgment judging whether or not a pixel being processed is a white-background field.

Claim 51 (Withdrawn): The image-forming device as claimed in claim 49, wherein said white-background judgment judges that the pixel being processed is the white-background field, when more than a predetermined number of pixels having input pixel data less than a predetermined value exist in a predetermined field centered around the pixel being processed.

Claim 52 (Withdrawn): The image-forming device as claimed in claim 50, wherein said white-background judgment judges that the pixel being processed is the white-background field, when more than a predetermined number of pixels having input pixel data

less than a predetermined value exist in a predetermined field centered around the pixel being processed.

Claim 53 (Withdrawn): The image-forming device as claimed in claim 39, wherein said edge level is maximized, when data of a pixel being processed is more than a predetermined value.

Claim 54 (Withdrawn): The image-forming device as claimed in claim 41, wherein said edge level is maximized, when data of a pixel being processed is more than a predetermined value.

Claim 55 (Withdrawn): The image-forming device as claimed in claim 47, wherein said edge level is maximized, when data of a pixel being processed is more than a predetermined value.

Claim 56 (Withdrawn): The image-forming device as claimed in claim 48, wherein said edge level is maximized, when data of a pixel being processed is more than a predetermined value.

Claim 57 (Withdrawn): The image-forming device as claimed in claim 39, wherein after said edge level is subjected to an expanding process to be selected as a largest edge level from among edge levels in a predetermined expansion field, said edge level is subjected to a contracting process to be selected as a smallest edge level from among edge levels in a predetermined contraction field.

Claim 58 (Withdrawn): The image-forming device as claimed in claim 41, wherein after said edge level is subjected to an expanding process to be selected as a largest edge level from among edge levels in a predetermined expansion field, said edge level is subjected to a contracting process to be selected as a smallest edge level from among edge levels in a predetermined contraction field.

Claim 59 (Withdrawn): The image-forming device as claimed in claim 57, wherein sizes of said expansion field and said contraction field are changed according to an output mode.

Claim 60 (Withdrawn): The image-forming device as claimed in claim 58, wherein sizes of said expansion field and said contraction field are changed according to said output mode.

Claim 61 (Withdrawn): The image-forming device as claimed in claim 59, wherein the size of said contraction field is smaller than the size of said expansion field.

Claim 62 (Withdrawn): The image-forming device as claimed in claim 60, wherein the size of said contraction field is smaller than the size of said expansion field.

Claim 63 (Withdrawn): The image-forming device as claimed in claim 59, wherein said edge level is not subjected to said contracting process in an output mode aimed at a text image.

Claim 64 (Withdrawn): The image-forming device as claimed in claim 60, wherein said edge level is not subjected to said contracting process in an output mode aimed at a text image.

Claim 65 (New): The image-processing device as claimed in claim 17,

wherein an image characteristic of said multivalued image data is extracted to control the amplitude of the plurality of quantization threshold values.

Claim 66 (New): The computer readable recording medium as claimed in claim 23, further comprising

image-characteristic extract program code means for extracting an image characteristic of said multivalued image data,

wherein amplitude of said quantization threshold values of said quantization-threshold-produce-code means is controlled according to a characteristic amount output by said image-characteristic-extract program code means.

Claim 67 (New): The computer readable recording medium as claimed in claim 24,

wherein an image characteristic of said multivalued image data is extracted to control the amplitude of the plurality of quantization threshold values.

Claim 68 (New): The image-processing method as claimed in claim 25, further comprising an image-characteristic-extract step of extracting an image characteristic of said multivalued image data,

wherein amplitude of said quantization threshold values is controlled according to a characteristic amount output in the image-characteristic-extract step.

Claim 69 (New): The image-processing method as claimed in claim 36,

wherein an image characteristic of said multivalued image data is extracted to control the amplitude of the plurality of quantization threshold values.

Claim 70 (New): The image-processing device as claimed in claim 1, wherein said random dither quantize unit comprises an error diffusion calculate unit for error diffusion calculation.

Claim 71 (New): The image-processing device as claimed in claim 17, wherein the random dither process includes error diffusion calculation.

Claim 72 (New): The computer readable recording medium as claimed in claim 23, wherein the random dither process includes error diffusion calculation.

Claim 73 (New): The computer readable recording medium as claimed in claim 24, wherein the random dither process includes error diffusion calculation.

Claim 74 (New): The image-processing method as claimed in claim 26, wherein the random dither process includes error diffusion calculation.

Claim 75 (New): The image-processing method as claimed in claim 36, wherein the random dither process includes error diffusion calculation.